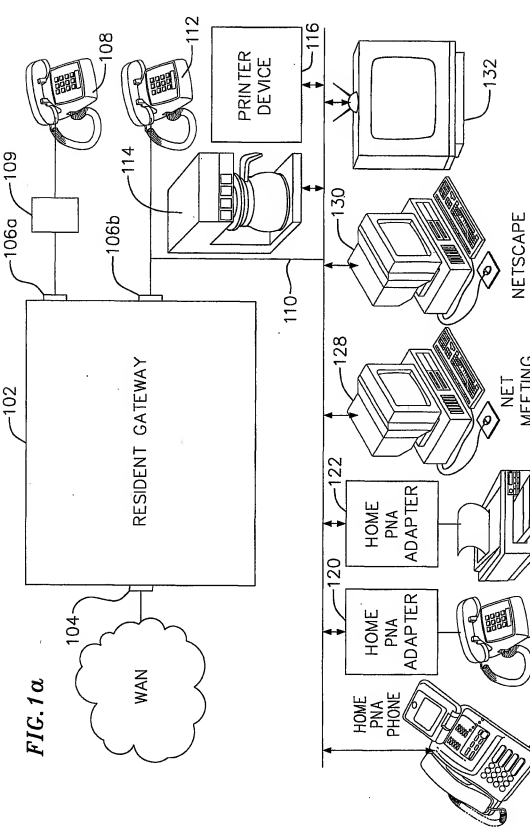

102
RESIDENT GATEWAY
104
WAN
106a
106b
108
109
110
112
PRINTER DEVICE
114
116
118
120
HOME PNA ADAPTER
122
HOME PNA ADAPTER
124
126
HOME PNA PHONE
128
NET MEETING
130
NETSCAPE
132

FIG. 1a

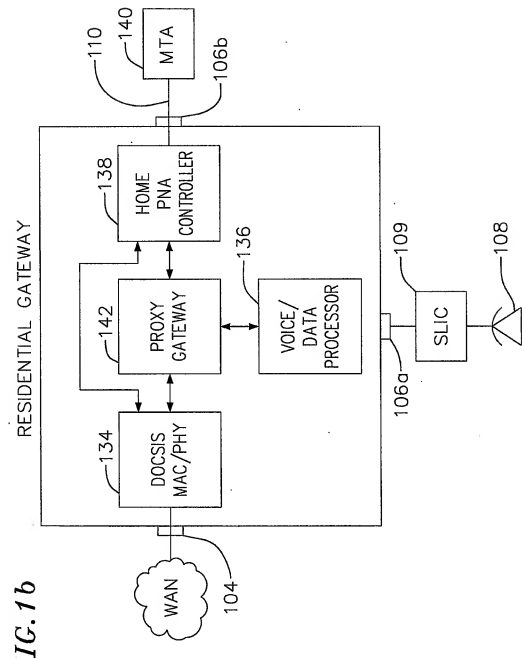

RESIDENTIAL GATEWAY
WAN
104
DOCSIS MAC/PHY
134
PROXY GATEWAY
142
HOME PNA CONTROLLER
138
VOICE/ DATA PROCESSOR
136
MTA
140
110
106b
106a
SLIC
109
108

FIG. 1b

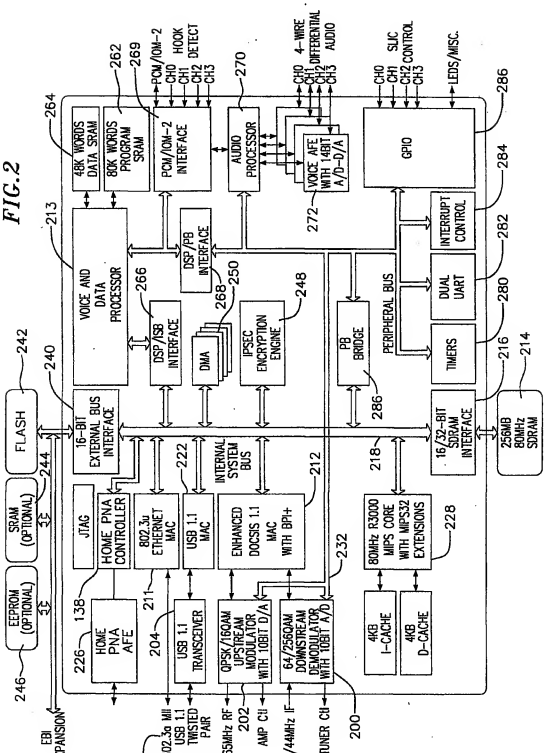
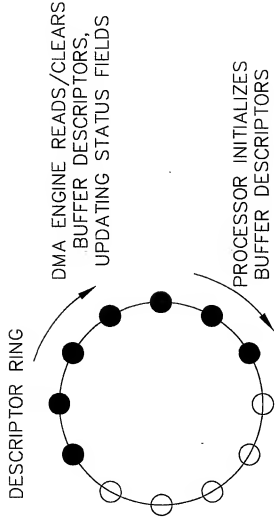


FIG.2
EEPROM (OPTIONAL)
SRAM (OPTIONAL)
FLASH
242
240
244
246
32
32
EDI EXPANSION
JTAG
138
HOME PNA CONTROLLER
802.3u ETHERNET MAC
211
USB 1.1 MAC
222
INTERNAL SYSTEM BUS
ENHANCED DOCSIS 1.1 MAC WITH BPI+
212
232
80MHz R3000 MIPS CORE WITH MPS32 EXTENSIONS
228
218
16/32-BIT SDRAM INTERFACE
256MB 80MHz SDRAM
214
216
PB BRIDGE
286
PERIPHERAL BUS
TIMERS
280
DUAL UART
INTERRUPT CONTROL
282
GPIO
284
286
LEDS/MISC.
CH0 SLIC
CH1
CH2 CONTROL
CH3
CH0 4-WIRE
CH1 DIFFERENTIAL
CH2 AUDIO
CH3
VOICE AFE WITH 14BIT A/D-D/A
272
AUDIO PROCESSOR
270
PCM/IOM-2 INTERFACE
CH0 HOOK
CH1
CH2 DETECT
CH3
262
269
PCM/IOM-2
48K WORDS DATA SRAM
80K WORDS PROGRAM SRAM
264
VOICE AND DATA PROCESSOR
213
DSP/PIB INTERFACE
250
266
DSP/ISB INTERFACE
DMA
IPSEC ENCRYPTION ENGINE
248
268
16-BIT EXTERNAL BUS INTERFACE
240
HOME PNA AFE
226
USB 1.1 TRANSCEIVER
204
QPSK/16QAM UPSTREAM MODULATOR WITH 10BIT D/A
64/256QAM DOWNSTREAM DEMODULATOR WITH 10BIT A/D
4KB I-CACHE
4KB D-CACHE
802.3u MII
USB 1.1 TWISTED PAIR
210
0-65MHz RF
202
AMP CTL
36/44MHz IF
TUNER CH
200

FIG. 3


DESCRIPTOR RING
DMA ENGINE READS/CLEARS BUFFER DESCRIPTORS, UPDATING STATUS FIELDS
PROCESSOR INITIALIZES BUFFER DESCRIPTORS

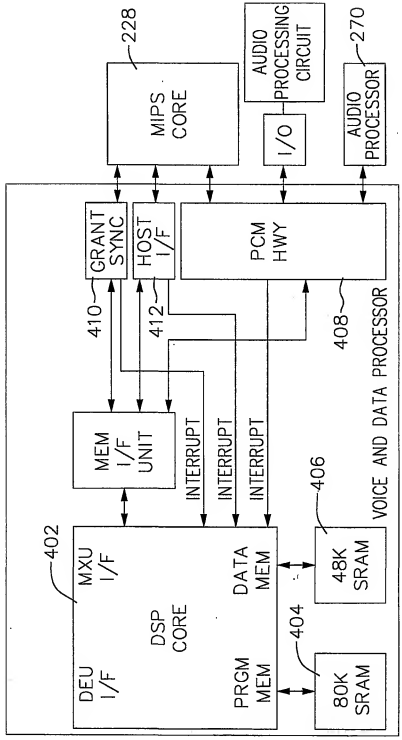
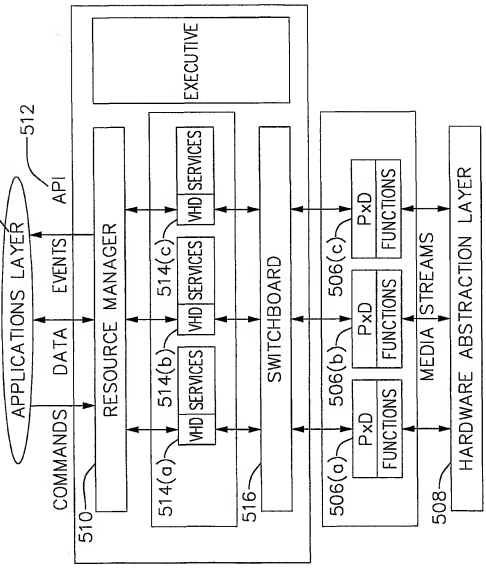

228
MIPS CORE
AUDIO PROCESSING CIRCUIT
I/O
AUDIO PROCESSOR
270
GRANT SYNC
HOST I/F
PCM HWY
410
412
408
MEM I/F UNIT
INTERRUPT
INTERRUPT
INTERRUPT
406
402
MXU I/F
DSP CORE
DATA MEM
48K SRAM
VOICE AND DATA PROCESSOR
DEU I/F
PRGM MEM
404
80K SRAM

FIG. 4

FIG. 5a


APPLICATIONS LAYER
502
512
COMMANDS
DATA
EVENTS
API
510
RESOURCE MANAGER
EXECUTIVE
514(a)
514(b)
514(c)
VHD
SERVICES
516
SWITCHBOARD
506(a)
506(b)
506(c)
PxD
FUNCTIONS
MEDIA STREAMS
508
HARDWARE ABSTRACTION LAYER
TO UNDERLYING HARDWARE

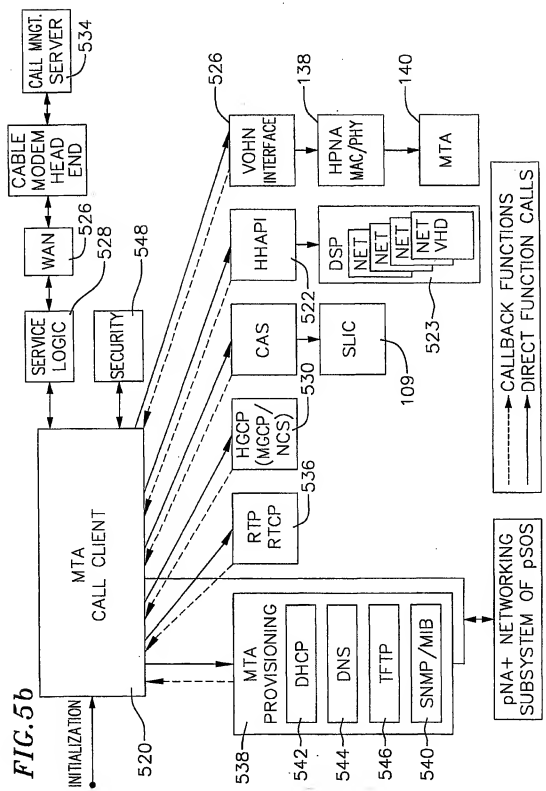
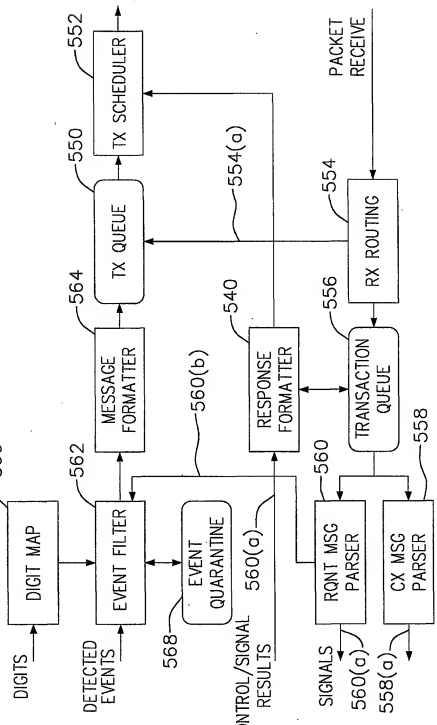

CALL MNGT. SERVER
534
CABLE MODEM HEAD END
526
WAN
528
SERVICE LOGIC
548
SECURITY
MTA CALL CLIENT
INITIALIZATION
520
526
VOHN INTERFACE
138
HPNA MAC/PHY
140
MTA
HHAPI
DSP
NET
NET
NET
NET
VHD
522
CAS
SLIC
523
109
530
HGCP (MGCP/ NCS)
536
RTP RTCP
MTA PROVISIONING
538
DHCP
542
DNS
544
TFTP
546
SNMP/MIB
540
pNA+ NETWORKING SUBSYSTEM OF pSOS
CALLBACK FUNCTIONS
DIRECT FUNCTION CALLS

FIG. 5b

FIG.5c


566
562
564
540
556
560
558
550
552
554
DIGIT MAP
EVENT FILTER
MESSAGE FORMATTER
RESPONSE FORMATTER
TRANSACTION QUEUE
RQNT MSG PARSER
CX MSG PARSER
TX QUEUE
TX SCHEDULER
RX ROUTING
EVENT QUARANTINE
DIGITS
DETECTED EVENTS
568
CONTROL/SIGNAL RESULTS
560(a)
560(b)
554(a)
SIGNALS
560(a)
558(a)
PACKET RECEIVE

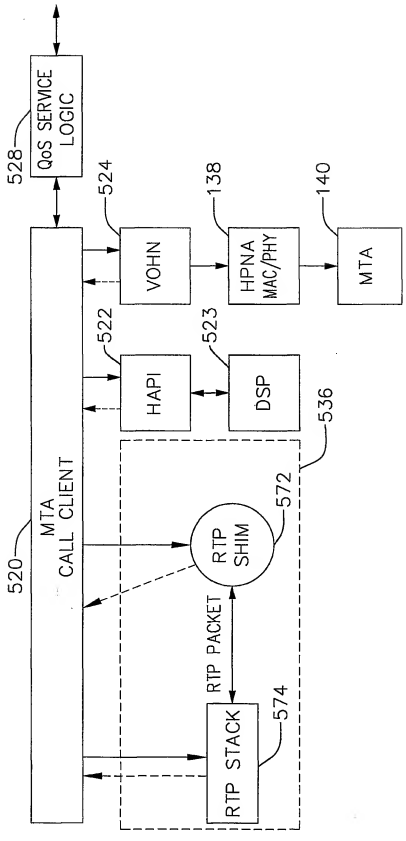

528
QoS SERVICE LOGIC
524
VOHN
138
HPNA MAC/PHY
140
MTA
522
HAPI
523
DSP
536
520
MTA CALL CLIENT
RTP SHIM
572
RTP PACKET
574
RTP STACK

FIG.5d

FIG. 5e

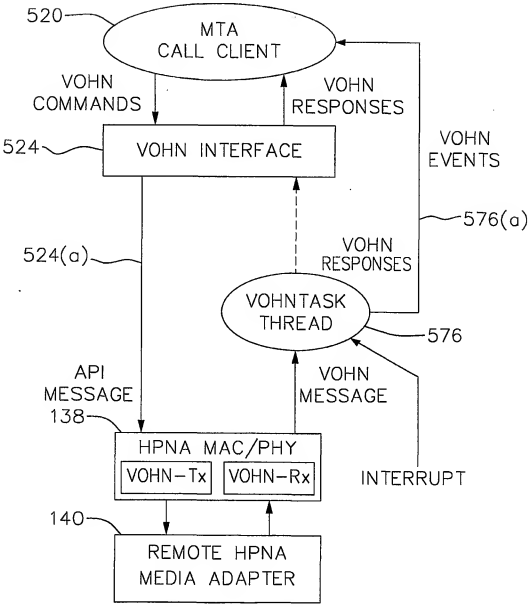

520
MTA
CALL CLIENT
VOHN
COMMANDS
VOHN
RESPONSES
524
VOHN INTERFACE
VOHN
EVENTS
576(a)
524(a)
VOHN
RESPONSES
VOHNTASK
THREAD
576
API
MESSAGE
138
VOHN
MESSAGE
HPNA MAC/PHY
VOHN-Tx
VOHN-Rx
INTERRUPT
140
REMOTE HPNA
MEDIA ADAPTER

FIG.5f

CALL STATE	PROXY GATEWAY	MEDIA ADAPTER
IDLE	CAS: LCF →	
	←	CAS: LO (ONHOOK)
OFFHOOK	←	CAS: LC (OFFHOOK)
DIALTONE	CAS: LCF → CPTONE: DIALTONE	
DIALING	←	CAS: LC DIGIT: ON
	CAS: LCF → CPTONE: OFF	
	←	CAS: LC DIGIT: OFF
	←	CAS: LC DIGIT: ON
	←	CAS: LC DIGIT: OFF
WAITING	CAS: LCF → CPTONE: RINGBACK	
REMOTE ANSWER	CAS: LCF → CPTONE: OFF MODE: G729A	
TALK	CAS: LCF ↔ MODE: G729A VOICE: G729A	CAS: LC VOICE: G729A

FIG.5g

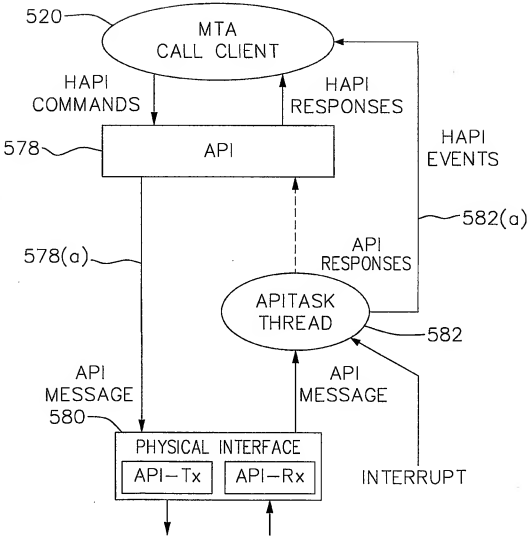

520
MTA
CALL CLIENT
HAPI
COMMANDS
HAPI
RESPONSES
578
API
HAPI
EVENTS
582(a)
578(a)
API
RESPONSES
APITASK
THREAD
582
API
MESSAGE
580
API
MESSAGE
PHYSICAL INTERFACE
API–Tx
API–Rx
INTERRUPT

FIG. 5h

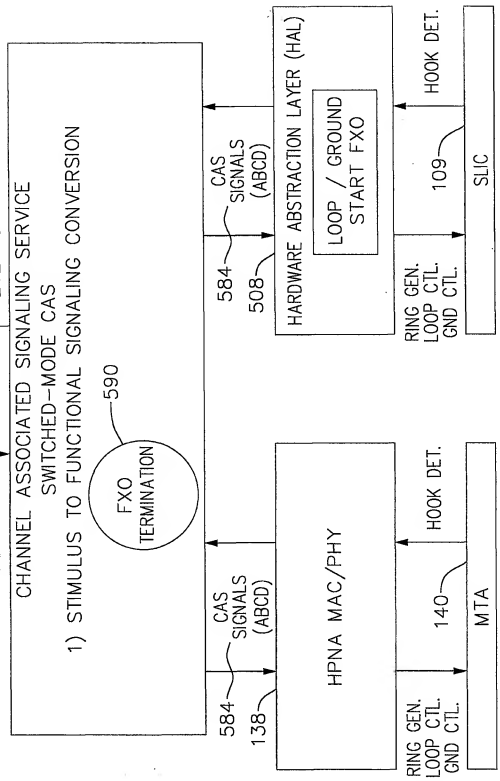
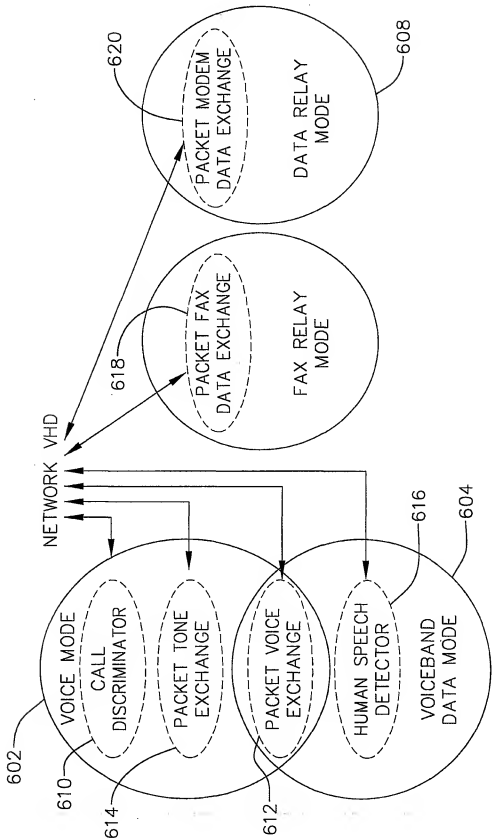

MTA
CALL CLIENT
520
API
COMMANDS
586
API
EVENTS
588
CHANNEL ASSOCIATED SIGNALING SERVICE
SWITCHED-MODE CAS
1) STIMULUS TO FUNCTIONAL SIGNALING CONVERSION
590
FXO
TERMINATION
584
CAS
SIGNALS
(ABCD)
508
HARDWARE ABSTRACTION LAYER (HAL)
LOOP / GROUND
START FXO
584
CAS
SIGNALS
(ABCD)
138
HPNA MAC/PHY
RING GEN.
LOOP CTL.
GND CTL.
HOOK DET.
109
SLIC
RING GEN.
LOOP CTL.
GND CTL.
140
HOOK DET.
MTA

FIG. 6


NETWORK VHD
602
VOICE MODE
CALL DISCRIMINATOR
PACKET TONE EXCHANGE
610
614
PACKET VOICE EXCHANGE
612
HUMAN SPEECH DETECTOR
VOICEBAND DATA MODE
616
604
618
PACKET FAX DATA EXCHANGE
FAX RELAY MODE
620
PACKET MODEM DATA EXCHANGE
DATA RELAY MODE
608

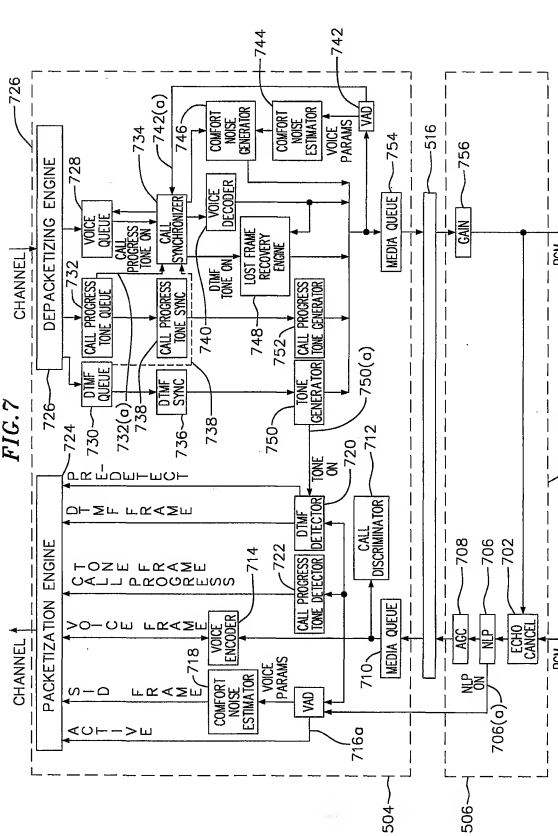


FIG. 7
CHANNEL
PACKETIZATION ENGINE
ACTIVE FRAME SIDS
VOICE FRAMES
COMFORT NOISE ESTIMATOR
VOICE PARAMS
VAD
VOICE ENCODER
CALL PROGRESS TONE DETECTOR
DTMF DETECTOR
CALL DISCRIMINATOR
TONE ON
DTMF FRAMES
PRE-DETECT
DEPACKETIZING ENGINE
DTMF QUEUE
CALL PROGRESS TONE QUEUE
VOICE QUEUE
CALL PROGRESS TONE ON
DTMF SYNC
CALL PROGRESS TONE SYNC
CALL SYNCHRONIZER
DTMF TONE ON
LOST FRAME RECOVERY ENGINE
VOICE DECODER
COMFORT NOISE GENERATOR
COMFORT NOISE ESTIMATOR
VOICE PARAMS
VAD
TONE GENERATOR
CALL PROGRESS TONE GENERATOR
MEDIA QUEUE
GAIN
PCM OUT
NLP ON
AGC
NLP
ECHO CANCEL
PCM IN
504
506
8060
726
724
728
730
732
732(a)
734
738
736
740
742
742(a)
744
746
748
750
750(a)
752
754
516
756
708
706
706(a)
702
712
720
722
714
718
716a
710

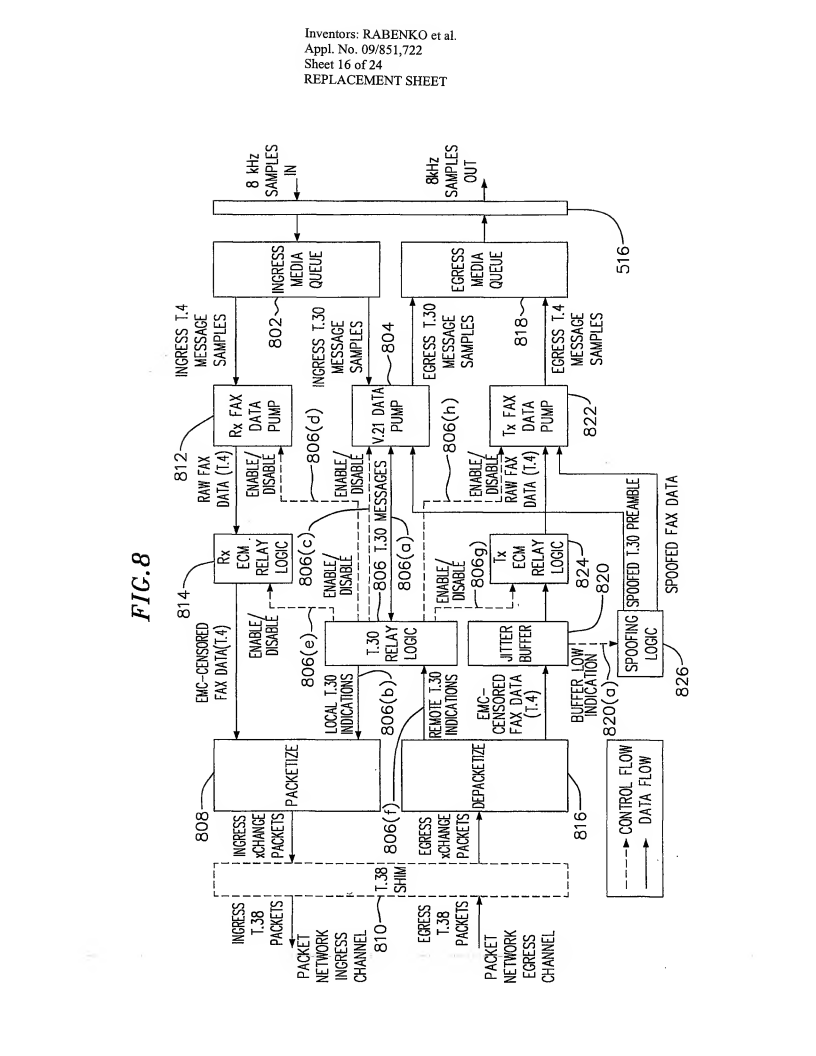

8 kHz SAMPLES IN
8kHz SAMPLES OUT
516
INGRESS MEDIA QUEUE
802
EGRESS MEDIA QUEUE
818
INGRESS T.4 MESSAGE SAMPLES
INGRESS T.30 MESSAGE SAMPLES
804
EGRESS T.30 MESSAGE SAMPLES
EGRESS T.4 MESSAGE SAMPLES
812
Rx FAX DATA PUMP
806(d)
V.21 DATA PUMP
806(h)
Tx FAX DATA PUMP
822
RAW FAX DATA (T.4)
ENABLE/ DISABLE
806 T.30 MESSAGES
814
Rx ECM RELAY LOGIC
806(c)
806(a)
Tx ECM RELAY LOGIC
824
820
EMC-CENSORED FAX DATA(T.4)
806(e)
T.30 RELAY LOGIC
806(g)
JITTER BUFFER
LOCAL T.30 INDICATIONS
806(b)
REMOTE T.30 INDICATIONS
EMC-CENSORED FAX DATA (T.4)
BUFFER LOW INDICATION
820(a)
SPOOFING LOGIC
826
SPOOFED T.30 PREAMBLE
SPOOFED FAX DATA
808
INGRESS xCHANGE PACKETS
PACKETIZE
806(f)
EGRESS xCHANGE PACKETS
DEPACKETIZE
816
T.38 SHIM
INGRESS T.38 PACKETS
PACKET NETWORK INGRESS CHANNEL
810
EGRESS T.38 PACKETS
PACKET NETWORK EGRESS CHANNEL
CONTROL FLOW
DATA FLOW

FIG.8

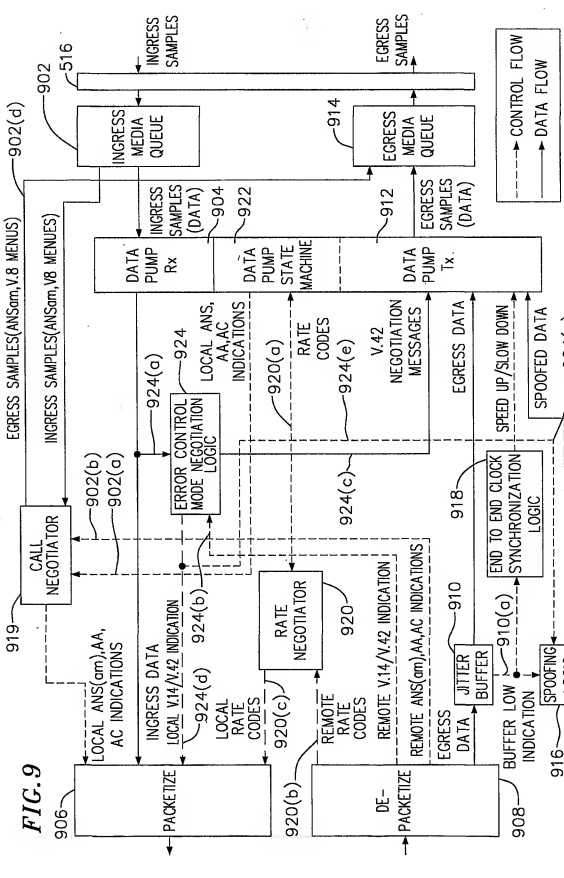
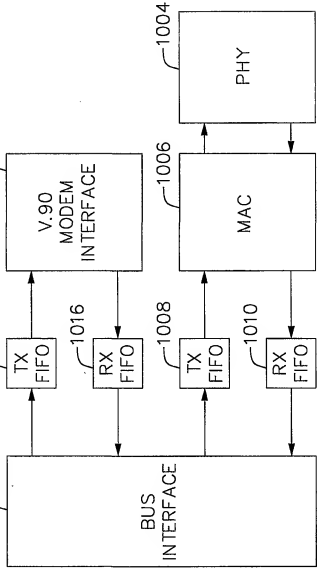


FIG. 9
902(d)
902
516
INGRESS SAMPLES
EGRESS SAMPLES
INGRESS MEDIA QUEUE
EGRESS MEDIA QUEUE
914
CONTROL FLOW
DATA FLOW
EGRESS SAMPLES(ANSam,V.8 MENUES)
INGRESS SAMPLES(ANSam,V8 MENUES)
DATA PUMP Rx
INGRESS SAMPLES (DATA)
904
922
DATA PUMP STATE MACHINE
912
EGRESS SAMPLES (DATA)
DATA PUMP Tx
924(a)
924
LOCAL ANS, AA,AC INDICATIONS
920(a)
RATE CODES
924(e)
V.42 NEGOTIATION MESSAGES
EGRESS DATA
SPEED UP/SLOW DOWN
SPOOFED DATA
924(e)
902(b)
902(a)
ERROR CONTROL MODE NEGOTIATION LOGIC
924(c)
918
END TO END CLOCK SYNCHRONIZATION LOGIC
919
CALL NEGOTIATOR
RATE NEGOTIATOR
920
910
JITTER BUFFER
910(a)
SPOOFING LOGIC
916
LOCAL ANS(am),AA, AC INDICATIONS
INGRESS DATA
LOCAL V.14/V.42 INDICATION
924(d)
924(b)
LOCAL RATE CODES
920(c)
REMOTE RATE CODES
REMOTE V.14/V.42 INDICATION
REMOTE ANS(am),AA,AC INDICATIONS
EGRESS DATA
BUFFER LOW INDICATION
906
PACKETIZE
DE-PACKETIZE
908
920(b)

FIG. 10


1002
BUS INTERFACE
1014
TX FIFO
1016
RX FIFO
1012
V.90 MODEM INTERFACE
1008
TX FIFO
1010
RX FIFO
1006
MAC
1004
PHY

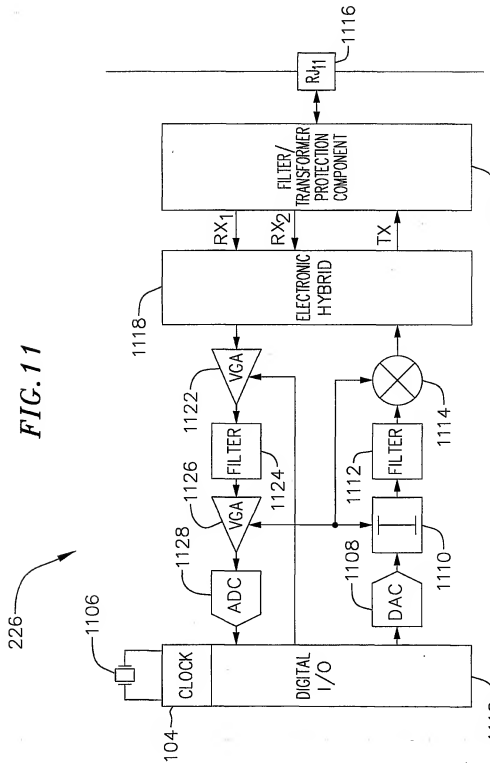

226
1106
1104
CLOCK
DIGITAL I/O
1112
ADC
1128
VGA
1126
FILTER
1124
VGA
1122
1118
RX1
RX2
TX
ELECTRONIC HYBRID
FILTER/ TRANSFORMER PROTECTION COMPONENT
1120
1116
RJ11
DAC
1108
1110
FILTER
1112
1114

FIG. 11

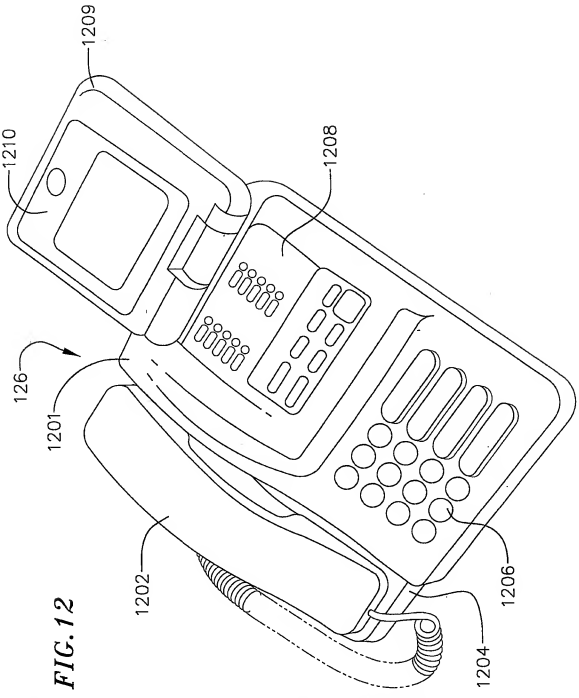
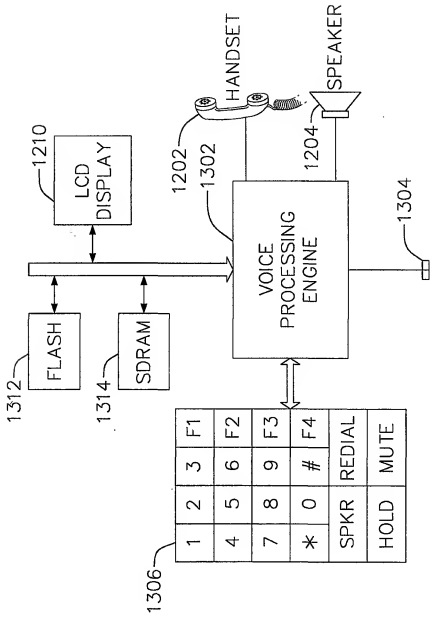


FIG. 12

FIG. 13


1210
LCD DISPLAY
1202
HANDSET
SPEAKER
1204
1302
VOICE PROCESSING ENGINE
1304
FLASH
1312
SDRAM
1314
1306
1 2 3 F1
4 5 6 F2
7 8 9 F3
* 0 # F4
SPKR REDIAL
HOLD MUTE

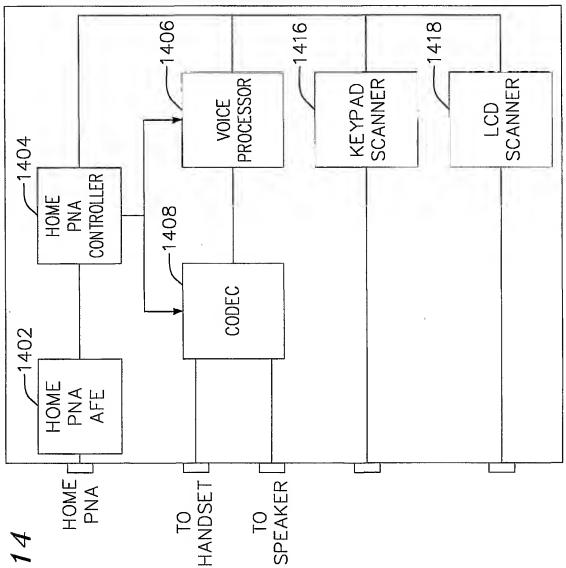

HOME PNA
TO HANDSET
TO SPEAKER
HOME PNA AFE
1402
HOME PNA CONTROLLER
1404
CODEC
1408
VOICE PROCESSOR
1406
KEYPAD SCANNER
1416
LCD SCANNER
1418

FIG. 14

FIG. 15

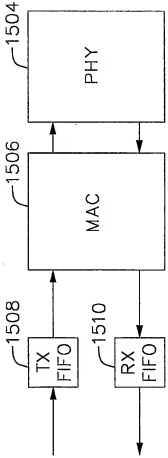
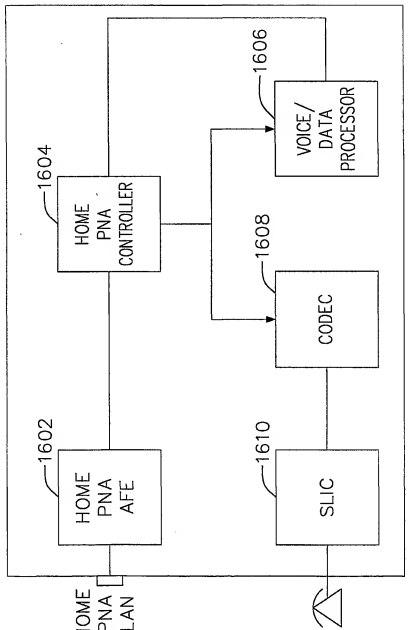


FIG. 16


HOME PNA LAN
1602
HOME PNA AFE
1604
HOME PNA CONTROLLER
1606
VOICE/ DATA PROCESSOR
1608
CODEC
1610
SLIC